

Probing Titan's Atmosphere With a Stellar Occultation

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The 3 July 1989 occultation of 28 Sgr by Titan was observed from two stations in Israel: the Wise Observatory 1m telescope and a portable 0.36m telescope at Kibbutz Ein Harod. It was also observed from Italy at the Vatican Observatory 0.6m telescope at Castel Gandolfo. Excellent data with signal/background of about 30/1 were obtained. The star was readily detectable *throughout* the occultation, reaching a minimum normalized flux ϕ of about 0.05. The occultation probed Titan's atmosphere in a region which was not studied by the Voyager spacecraft, i.e. from an altitude range of about 250 km to about 450 km. This region is important for aerobraking of Titan entry probes, and direct information about its properties is important for the Cassini mission. Fig. 1 shows occultation data (normalized stellar flux ϕ vs universal time) for the NASA-supported stations, along with data from the collaborating group at the Wise Observatory in Israel. Clouds prevented observation of immersion at the Vatican Observatory (Vatican data have been shifted earlier in time by 100 sec for ease in plotting).

Strong scintillation of the star is noticeable in the data records, and provides information on waves/turbulence in Titan's high atmosphere. The Titan data have been analyzed in a preliminary way (W.B. Hubbard *et al.*, *Nature* **343**, 353-355, 1990), and yield a temperature and pressure of about 183 K and 5 μ bar respectively, at an altitude of about 456 km. These results validate engineering models being used to design a Titan entry probe.

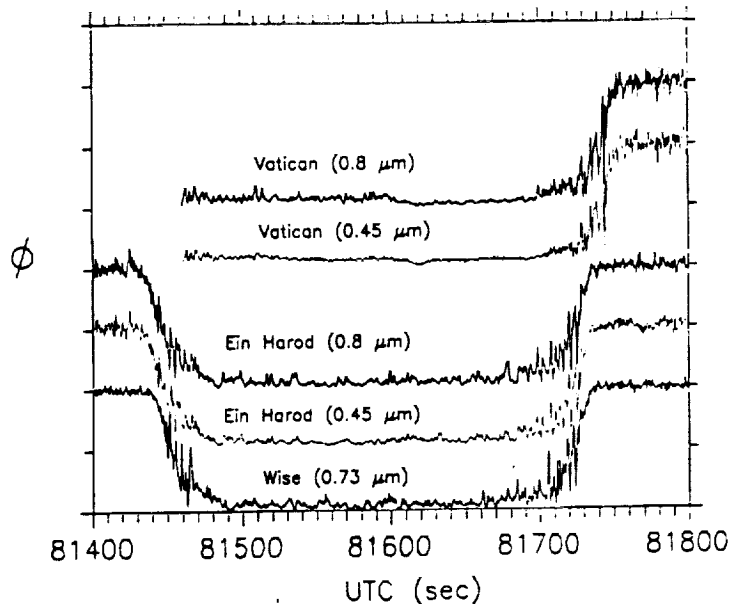


Fig. 1: The Titan occultation observed at several wavelengths and stations.